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SUPERSEDING

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**DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
STANDARD**

PAINT SYSTEMS FOR EQUIPMENT



Prepared By:

SYSTEMS RESEARCH AND DEVELOPMENT SERVICE

FAA-STD-012a

FORWARD

The appearance of FAA equipment and the cost of maintaining it are directly affected by the quality of the protective finish. The real value of this finish can only be measured by its ability to resist wear in normal usage and adequately withstand the deleterious effects of the environment in which the equipment must operate.

The excellence of the paint means little if applied to an improperly prepared surface; premature failure of the protective finish is certain to occur. Correct thickness of a paint coat has a direct bearing on the durability of the finish. The compatability of materials is an indispensable requirement to a quality finish.

This standard has been prepared by the Systems Research and Development Service to provide the necessary engineering guidance, consistent with the state of the art, for use in development, manufacturing and inspection of FAA equipment finishes. Compliance with this standard will promote uniformity in finish procedures, minimize the chances of technical errors and contribute materially to the quality level of the protective finishes of FAA equipment.

Any questions or suggested modifications should be directed to the Environmental Development Division, RD-400, Attn: RD-420.

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FEDERAL AVIATION ADMINISTRATION

PAINT SYSTEMS FOR EQUIPMENT

CHAPTER 1. SCOPE

1.1 Scope.- This standard establishes the procedures for cleaning, pre-treatment and painting of Federal Aviation Administration equipment so as to provide adequate protection and inhibit corrosion or other forms of deterioration.

CHAPTER 2. PURPOSE

2.1 Purpose.- The purpose of this standard is to provide and implement proven, acceptable equipment paint systems, consistent with contemporary materials and techniques to meet specific equipment needs in terms of operational environment.

CHAPTER 3. DEFINITIONS

3.1 Definitions.- The term "paint" as used herein includes paints, enamels and other coatings, whether used as primers, intermediates or finish coats. Paints to be used are for protective and decorative effects on surfaces. Detailed definitions concerning general terminology as used in the paint industry are set forth in Federal Standard No. 141, Section 8.

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CHAPTER 4. MATERIALS

4.1 General.- Table IA lists various types of paints that should be used on equipment. The first column is a list of materials by name. The second column is a list of the corresponding Federal or Military Specifications used for procurement of the specific type of paint. The third column further identifies the materials as to their use, application or other pertinent information. Materials shall conform to the specifications in the painting schedule herein and to the requirements hereinafter specified. Colors and tints shall be as specified in the equipment specification or the invitation for bid and shall conform to the colors in Federal Standard 595 with ±.5 NBS units. Proprietary brands of materials similar in quality and effectiveness may be used only at the option of the contracting officer and provided proof of quality is submitted in the form of conclusive testing data. Table IA also includes references to other publications pertaining to cleaning procedures, chemical pretreatment et al.

TABLE IA

<u>Material</u>	<u>Specification</u>	<u>Remarks</u>
Exterior Type Acrylic Enamel, Thermosetting	No specification available (see Note 1 for require- ments).	Material shall be in conformance with prop- erties as described in Note 1.
Interior Type Acrylic Enamel, Thermosetting	No specification available (see Note 1 for require- ments).	Material shall be in conformance with prop- erties as described in Note 1.
Enamel, Alkyd, Gloss (For Ex- terior and In- terior Surfaces)	TT-E-489	Class A to be used for maintenance work; Class B for factory finishing (baking).
Enamel, Phenolic Lusterless, Outside	TT-E-522	This material is used as the finish coat for items subject to water immersion.
Pretreatment Primer	MIL-P-15328 (Two-package) MIL-P-14504 (One-package)	For use on aluminum and aluminum alloy, ferrous and zinc surfaces.
Anodic Coating	MIL-A-8625	For use on aluminum and aluminum alloy surfaces.
Primer Coating	MIL-P-8585	Has low moisture sensi- tivity. Excellent for use in areas of high humidity.
Primer Coating	TT-P-636	For use on metal and wood surfaces. Also for use as gear case sealer. Can either be air dried or baked.
Primer Coating	TT-P-615	For use on metal sur- faces.
Primer Coating	TT-P-645	May be used as gear case sealer.
Zinc-dust, Zinc- oxide Primer	TT-P-641	Two-component, ready- to-mix primer.

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TABLE IA

<u>Material</u>	<u>Specification</u>	<u>Remarks</u>
Phenolic Primer Coating	MIL-P-12742	For use on items which are subject to water im- mersion. Use with phenolic finish coat.
Wood Sealer and Preservative	MIL-S-13518	3 minute dip (immersion) treatment for wood.
Wood Preservative, Pentachlorophenol	TT-W-570	For Treatment of wood.
Tetrachlorophenol, Oil Base	----	For treatment of seasoned wood.
Black Iron Oxide Coating	MIL-C-13924	Limited corrosion pro- tection under mildly corrosive conditions.
Thermal Insulating Paint	MIL-C-46081	For use on equipment exposed to heat and where fire protection is required.
Chemical Films and Chemical Materials	MIL-C-5541	For use on aluminum and aluminum alloy surfaces.
Semigloss Alkyd Enamel	TT-E-529	For use on interior and exterior wood and metal surfaces where medium gloss is desired. This enamel can be either air- dried or baked.
Lusterless Alkyd Enamel	TT-E-527	For use on interior and exterior surfaces where very low gloss is de- sired. This enamel can be either air-dried or baked.
Gloss Enamel	MIL-E-7729	For interior or exterior use. Type I - air-drying. Type II - low temperature baking. Type III - high temperature baking.

TABLE IA

<u>Material</u>	<u>Specification</u>	<u>Remarks</u>
Fire Retardant Coating	MIL-C-46081	This material is intumescent; has thermal insulating and fire retardant properties.
Cleaning Methods and Pretreatment of Ferrous Surfaces for Organic Coatings	TT-C-490	For use on ferrous metals, zinc or aluminum surfaces. Type I - Zinc Phosphate. Type II - Iron Phosphate.
Magnesium Alloy, Process for Corrosion, Protection of	MIL-M-3171	Materials and procedures to be used in the processing of magnesium alloy surfaces. Type I - Chrome Pickle Treatment. Type III - Dichromate Treatment.
Tape, Masking; Paper (Pressure-Sensitive)	UU-T-106	For use in testing adhesion (see paragraph 8.3.3.).
Coating, Baked and Air-Dried	TT-C-001558 (FAA-TRANS)	For use on metal and wood surfaces, under normal interior environment only.

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TABLE IAReferenced Publications

Federal Standard	Fed. Std. No. 141	Paint, Varnish, Lacquer, and Materials; Methods of Inspection, Sampling and Testing
Other Publications	Steel Structures Painting Council Surface Preparation Specification SSPC- SP-10-63	Ferrous metal cleaning procedures
	Federal Aviation Administration Standard FAA-STD-001	Color and Texture of Finishes

Note 1

Since no Federal specification is available for acrylic thermo-setting enamels, the following properties shall be achieved in the acrylic finish for FAA work:

- A. The baked acrylic finish of 1.5 mils dry film thickness shall withstand bending a sheet of 18 gauge steel coated with the finish 90 degrees around a rod 1/8" (3mm) in diameter without cracking or peeling.
- B. The baked acrylic finish shall successfully withstand the action of the following acids, bases, salts and solvents, without the texture, appearance or durability of the finish being affected:

Sulphuric acid, 33% solution	1 hour exposure
Nitric acid, 25% solution	" " "
Hydrochloric acid	" " "
Glacial acetic acid	" " "
Methyl Alcohol, 37%	" " "
Phenol 85%, 25% solution	" " "
Xylene	" " "
Ether	" " "
Carbon Tetrachloride	" " "
Formaldehyde 40% solution	" " "
Hydrogen Peroxide 5% solution	" " "
Ammonium Hydroxide 25% solution	" " "
Sodium Hydroxide solution	" " "

TABLE IA

One hour application of Ethyl Acetate, Acetone and Chloroform shall result in only slight dulling of surface luster. Trickling boiling water over finish for 5 minutes shall cause no discoloration, softening or change in surface appearance.

- C. Interior type baked finish shall withstand 500 hours, exterior type baked finish shall withstand 1000 hours, at 100 percent relative humidity at 100° F. cabinet temperature when tested in accordance with Method 6201 of Federal Standard No. 141; no blisters shall occur to an extent greater than illustrated for "Few Blisters" of No. 8 in Figure 4 of Federal Standard No. 141, Method 6461.

Note: Use exterior or interior acrylic finish as required.

- D. The interior type baked finish shall be tested for 500 hours, the exterior type baked finish shall be tested for 1000 hours, for salt spray resistance in accordance with Method 6061 of Federal Standard No. 141. The salt fog spray shall be produced from a 5% sodium chloride solution with maximum permissible undercutting of the scored line of 1/16 of an inch.

Note: Use exterior or interior acrylic finish as required.

- E. The baked finish shall pass a pencil hardness rating of 4H when tested in accordance with paragraph 8.3.5 of this standard.

CHAPTER 5. CLEANING METHODS OF SURFACES FOR ORGANIC COATINGS

5.1 General.- Where a specific paint system is not specified in the equipment specification or invitation for bid, details of the proposed paint system, including materials and equipment to be used by the contractor shall be submitted to the Contracting Officer in writing and written approval received, prior to the commencement of production. The exact designation of any material proposed for use, together with the name of the manufacturer, should be stated. The proposed procedure should include a detailed method of control including limits for time, temperature, concentration, baking schedules and all other pertinent details that will ensure conformance with the requirements of this standard. No deviation from the approved process shall be permitted without prior written approval of the Contracting Officer or his representative. Approval of process, materials and equipment implies no guarantee of acceptance of the results obtained in use. Regardless of any process or materials approved, items shall conform to all the applicable requirements of this standard.

5.2 Ferrous metal surfaces.- Except as otherwise specified herein, ferrous metal surfaces to be painted shall be surface cleaned to near white sand blast cleaning in accordance with Steel Structures Painting Council Surface Preparation Specification SSPC-SP-10-63. Sandblasting shall be preceded by solvent cleaning if necessary, to remove all oil, grease, mill scale, products of corrosion, dirt, casting sand, welding slag or spatter and other foreign substances that might be detrimental to the applied coating system. Oil and grease contamination resulting from fabrication, machining or handling subsequent to blast cleaning shall be removed by either solvent (immersion, spray or vapor), hot alkali (immersion spray or electrolytic), or phosphoric acid (alcoholic, detergent or solvent type with detergent). Surfaces, such as machined parts and ferrous sheet metal thinner than 0.0625 inch which would be damaged by blast cleaning, shall not be blast cleaned. Blast cleaning will not be required nor will it be prohibited on component parts of equipment which are painted for protection during limited storage or from which the paint will be worn off almost immediately when placed in use; however, the surface to be painted shall be dry and free from oil, grease, dirt, rust and loose mill scale.

5.3 Ferrous surfaces of equipment.- Surfaces of metal castings shall receive near white sand blast cleaning in accordance with Steel Structures Painting Council Surface Preparation Specification SSPC-SP10-63. In lieu of blast cleaning, after being freed from grease and oil, other steel surfaces shall be cleaned to bare metal by chipping, powered wire brushing, or grinding as required for the removal of welding slag or spatter, mill scale, products of corrosion, dirt or other foreign substances. Sheet metal and sheet metal parts 0.1875 inch and thinner may be cleaned to bare metal by acid pickling in accordance with TT-C-490, Method VI. Old paint shall be removed from equipment requiring repainting by the use of an adequate paint remover.

5.4 Zinc surfaces to be painted.- Zinc surfaces, including zinc coated ferrous material, shall be thoroughly cleaned with solvent as necessary to remove all traces of oil, grease, dirt or other foreign matter. (Mineral Spirits is a good solvent to be used for cleaning.)

5.5 Aluminum and aluminum alloy surfaces.- Aluminum and aluminum alloy surfaces to be painted shall be thoroughly cleaned (method of cleaning optional with the supplier provided it gives a surface comparable to the chromic acid dip) to remove all traces of oil, grease, dirt, oxide film, welding flux, or other foreign matter.

5.6 Magnesium alloy surfaces.- Magnesium alloy surfaces shall be cleaned in accordance with Military Specification MIL-M-3171.

5.7 Wood Surfaces.- Wood surfaces to be painted shall be thoroughly cleaned of all dirt, oil, grease and other foreign matter with Mineral Spirits. Existing paint which shows signs of deterioration, loosening or chalking shall be removed.

CHAPTER 6. SURFACE PRETREATMENT

6.1 Ferrous metal, zinc, aluminum and aluminum alloy surfaces.- Ferrous metal, zinc, aluminum and aluminum alloy surfaces to be painted shall be treated with an organic pretreatment primer coating conforming to MIL-P-15328 or MIL-P-14504 as soon as possible after cleaning. As an alternate to the organic pretreatment primer coating, ferrous and zinc surfaces may be treated with a zinc phosphate (Type I) or iron phosphate (Type II) type of chemical conversion coating in accordance with TT-C-490. Aluminum and aluminum alloy surfaces may be treated in accordance with MIL-A-8625 or MIL-P-14504. Wash primer materials conforming to MIL-P-15328 or MIL-P-14504 shall not be applied to any painted surface or to any surface that is normally sealed by the manufacturer with gear case sealer. (Where sealers are required, materials conforming to the following specifications have proven satisfactory for use:

TT-P-636 - Primer Coating, Alkyd, Wood and Ferrous Metal
TT-P-645 - Primer, Paint, Zinc Chromate, Alkyd Type).

When sheet metal or parts fabricated of ferrous sheet metal are cleaned by phosphoric acid pickling, the treatment of the surface prior to painting shall be in accordance with TT-C-490, Types I or II. Any evidence of rust or contamination on a previously cleaned surface shall be cause for recleaning prior to treatment. All surfaces to be coated with thermosetting acrylic enamels, including magnesium alloy surfaces, shall be given a treatment to provide a bond between the finish and the metal to aid in the prevention of corrosion. This is accomplished by immersion of the surface in a degreasing solution followed by immersion in an iron phosphate solution and a chromic-acid solution to provide a complete non-metallic coating of complex iron-zinc phosphate which is insoluble in water. The phosphate coating shall be integral with the metal itself and its action as a paint base shall provide a bond with the acrylic thermosetting enamel and to retard corrosion of the base metal.

Any evidence of rust or contamination on a previously cleaned surface shall be cause for recleaning prior to treatment.

6.2 Magnesium alloy surfaces.- Magnesium alloy surfaces shall be treated in accordance with MIL-M-3171, Types I or III. Treated surfaces which become scratched in handling shall be touched up in accordance with MIL-M-3171, Type I. The requirements for touching up are not applicable to drilled or punched holes.

6.3 Wood surfaces.- Seasoned wood (wood dried to the specified moisture content appropriate for the size, species, and ultimate service conditions, but in no case having a moisture content greater than 12 percent of the weight of the oven-dried wood) shall be treated prior to painting by immersion for not less than 3 minutes in sealer conforming to MIL-S-13518, Type I, except that items too large for immersing shall be saturated by brushing or spraying. Wood items employing glue in fabrication shall be treated with sealer after fabrication. Green wood, wood having a moisture content greater than 12 percent, and seasoned wood shall be treated with preservative using an oil-base tetrachlorophenol preservative and the empty cell process. The petroleum oil used in the preservative shall in no way affect the paintability of wood so treated and the wood shall have a net retention of tetrachlorophenol of not less than 0.4 pound per cubic foot.

6.4 Hardware and hardware items.- Hardware and hardware items such as bolts, cap screws, washers, pins, springs, grease fittings, etc. are not required to be cleaned and treated prior to assembly and painting, if there is no evidence of rust or corrosion.

6.5 Corrosion-resisting steel surfaces.- Corrosion-resisting steel surfaces not to be painted shall be thoroughly cleaned and treated as follows, unless the corrosion-resisting steel has already been passivated and has not been contaminated or depassivated by working, forming, or shaping the end item:

- a. Degrease.
- b. Immerse for 30 minutes in a solution containing 20 percent by volume of nitric acid (sp.gr. 1.42) and 2 percent by weight of sodium dichromate, at 120° F. to 130° F.
- c. Rinse in clean hot water.
- d. Immerse for 1 hour in a solution containing 5 percent by weight of sodium dichromate at 140° F. to 160° F.
- e. Rinse in clean hot water.
- f. Rinse finally in hot water (160° F. to 210° F.); maintain rinse at pH 3 to 5 by addition of flake chromic acid or proprietary mixtures of chromic and phosphoric acid.

The surface shall then be given a dull finish in accordance with MIL-C-13924, Class 2. The process given here is primarily a passivating treatment for corrosion-resisting steels and not a cleaning treatment.

CHAPTER 7. PAINTING

7.1 Application.- Painting shall conform to the applicable type and portion of Table IA as specified, except that in production line paint application for the Type I system, an alternate commercial rust-inhibiting primer may be used in lieu of the primer specified, provided that the substituted primer has all of the service properties of the specified primer and is compatible with the finish coat specified. The paint shall be applied by any method (dip, flow-coat, brush, spray, etc.) which will deposit the dry film coat thickness specified in Tables II to VII inclusive, when measured on a flat surface, with an average of five readings taken. The first coat of paint or primer shall be applied to a dry, clean surface as soon as practicable after cleaning and treating the metal or wood surface as previously specified. Coatings shall be applied in an ambient and surface temperature of not less than 60° F. Paint and surface shall be approximately the same temperature except when hot spray is used. Thermosetting acrylic enamels may be applied by any method provided the qualifications set forth in Table IA are met. The thermosetting acrylic enamels shall be baked on at such temperatures to produce a film having the properties as specified in Table IA. (Manufacturer's directions should be followed carefully.) The finished surface shall be uniform, and be free from runs, sags and other defects. Panels or subassemblies prepainted prior to final assembly shall be treated and painted as specified herein. All surfaces shall be free from defects (runs, sags, etc.) which might interfere with the proper application and adhesion of subsequent coats. When painting any portion of the work is initiated, the complete operation, including the priming coats and finish coats, shall be completed as soon as practicable, allowing sufficient drying time between coats. Baked finishes other than those specified herein will be permitted if the baked finish meets the performance requirements of the applicable paint specification designated by the Contracting Officer. Proof is required.

CHAPTER 8. INSPECTION

8.1 Responsibility for inspection.- The supplier is responsible for the performance of all inspection requirements as specified herein. The supplier may utilize his own facilities or any commercial laboratory acceptable to the government. The government reserves the right to perform any of the inspection set forth in the paint specifications or this standard where deemed necessary to assure supplies and services conform to prescribed requirements.

8.2 Quality conformance inspection.- Equipment being processed in accordance with this standard shall be inspected at the various stages of cleaning, treating, and painting to assure that it is cleaned, pre-treated and painted in accordance with the requirements of this standard. Particular emphasis shall be placed on surface preparation, continuity, and uniformity of coatings, paint adhesion, dry film thickness and color. Treating and painting materials shall be sampled and tested to determine their conformance to the applicable specification. Failure to conform to any of the requirements of this standard shall be cause for rejection.

8.3 Tests on finished coatings.- For many protective coating systems, adequate control of surface preparation and of the preparation and application of paints is sufficient to determine the acceptability of the job. An example is wood surfaces. For some paint systems on metalwork, however, certain physical tests on the finished work are necessary.

8.3.1 Dry film thickness on ferrous surfaces.- Dry film thickness gages are available either as a self-contained pocket-size unit or a unit operated on 115-volt alternating current. The instruments are similar in operation and both are accurate. The alternating current gages are furnished in two types, one for thin coatings of 0.000 to 0.10 inch and one for thick coatings of 0.000 to 0.250 inch. The lower range instrument affords greater accuracy for coatings such as are specified in this standard and is, therefore, the more appropriate all-purpose instrument for FAA work.

The self-contained instrument is available in two ranges: 0 to 20 mils and 0 to $\frac{1}{4}$ inch. It is lightweight, easy to use in hard-to-reach areas, and inexpensive. Its greatest advantage is that it can be used in any location without the need for bringing in an outside source of electricity.

To operate the dry film thickness gage, the sensitivity head is placed on the coating and the thickness read in thousandths of an inch or mils directly from the dial of the instrument. The gage is cali-

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brated with thickness standards supplied with the instrument. Preferably, calibration should be made with the metal to be coated as the background. If this is impracticable, a small mild steel plate, say 4- by 4-inch of $\frac{1}{4}$ inch thickness, may be used as background. For greatest accuracy in calibrating the gage, a thickness standard which is close to the thickness of the coating to be measured should be used. During use, the gage setting should be checked from time to time.

The dry film thickness gage will give accurate readings throughout its entire range and its reliability is accepted by contractors. It has the advantage of not injuring the coating in any way. The head of the gage should be held lightly against the coating in order to avoid indentation, and therefore, low readings. If the A.C. gage is connected to a line having abnormal voltage fluctuations, it is desirable to stabilize conditions by means of constant-voltage transformers.

8.3.2 Film thickness on non-ferrous surfaces.- The dry film thickness on non-ferrous surfaces shall be determined in accordance with Method 6183 of Federal Standard No. 141.

8.3.3 Paint film adhesion.- The paint film adhesion can be tested by making 10 parallel cuts through the film and down to the metal approximately $1/16$ inch apart, by means of a knife or similar instrument. Ten similar cuts are then made at 90 degrees to, and crossing the first 10 cuts. A $3/4$ inch wide strip of masking tape (conforming to Federal Specification UU-T-106) is then applied to the area, adhesive side down. The tape is pressed down using two passes of a $4\frac{1}{2}$ -pound rubber-covered roller approximately $3\frac{1}{2}$ inches in diameter by $1\frac{3}{4}$ inches in width, the surface of which has a durometer hardness value within the range of 70-80. The roller shall be moved at the rate of approximately 1 inch per second using the weight of the roller only. The tape is removed in one abrupt motion. If more than 10% of the paint squares are removed by this test, the coated article so tested shall be rejected.

8.3.4 Drying time.- Each applied coat shall be in a proper state of cure or dryness before the application of the succeeding coat. When chemical pretreatments are used, sufficient time shall elapse between pretreatment and application of subsequent coat(s) of paint to permit any chemical action to be completed and the surface to dry. Paint shall be considered dry for recoating when an additional coat can be applied without development of any detrimental film irregularities such as lifting or loss of adhesion of the undercoat. Drying for each applied coat shall conform to that specified in the applicable specification or to the manufacturer's instructions when proprietary material is used. Drying times should be adjusted when unusual drying conditions are encountered.

8.3.5 Hardness.- The dry film hardness shall be determined by the use of a 2½H Eagle turquoise pencil. The wood shall be stripped from the pencil leaving the full diameter of the lead. The end of the head shall be flattened by using fine grit sand or emery paper so that it is 90° to the pencil axis. The pencil shall be held at a 45° angle to the film surface and pushed forward approximately ¼ inch using as much downward pressure as can be applied without breaking the pencil lead. The dry film shall not rupture when tested in accordance with this procedure.

8.3.6 Workmanship.- It is required that the appearance of the finished coat be commercially smooth and substantially free from flow lines, streaks, blisters, cracks, scratches, pinholes, chipped or flaked areas.

8.3.7 Mildew resistance.- There shall be no fungus growth when the paint is tested in accordance with Method 6271.1 of Federal Test Method Standard No. 141.

8.3.8 Color stability.- The proposed paint system shall be tested for 500 hours in an Atlas Type XW Sunshine ARC Weatherometer which is in accordance with Method 6151 in Federal Standard No. 141 or for 1000 hours in an Atlas Type DMC Enclosed Violet Carbon Arc Weatherometer or equivalent, operated in accordance with Method 6152 in Federal Standard No. 141 using cycle of 102 minutes of light and 18 minutes of light and demineralized water. When so exposed, the coating system shall show no more than very slight color change or chalking, and no other film defects. Allowable color change resulting from ultraviolet light exposure shall not exceed 4 NBS units of color change.

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Tests and corresponding requirements are as per Table IB.

TABLE IB

<u>Name</u>	<u>Test No. Reference</u>	<u>Requirements</u>
Dry film thickness on ferrous surfaces	Paragraph 8.3.1	Tables II, VII
Dry film thickness on non-ferrous surfaces	Paragraph 8.3.2	Tables III, IV, V, VI, VII
Paint film adhesion	Paragraph 8.3.3	Paragraph 8.3.3
Drying time	Paragraph 8.3.4	Paragraph 8.3.4
Hardness	Paragraph 8.3.5	Paragraph 8.3.5
Workmanship	Paragraph 8.3.6	Paragraph 8.3.6
Mildew resistance	Paragraph 8.3.7	Paragraph 8.3.7
Gloss, 60°	Method 6101 (1)	As specified (see 9.3.1)
Gloss, 85°	Method 6103 (1)	As specified (see 9.3.1)
Impact flexibility	Method 6226 (1)	20% minimum
1/8 inch mandrel	Method 6221 (1)	
Color stability	Method 6151 (1) Method 6152 (1)	Paragraph 8.3.8 Paragraph 8.3.8
Chemical resistance	Method 6081 (1)	Note 1B (2)
Blistering	Method 6071 (1)	Note 1C (2)
Salt Spray	Method 6061 (1)	Note 1D (2)
Washability	Method 6141 (1)	

(1) Federal Test Method Standard No. 141

(2) For all coating systems applied to ferrous metals only.

CHAPTER 9. PAINT SYSTEMS

9.1 General.- Surfaces listed in Tables II to VII inclusive shall receive the cleaning, surface preparation, paints and number of coats prescribed. Methods of cleaning and surface pretreatment prior to painting shall be accomplished in accordance with the detailed requirements as set forth in Chapters 5 and 6 for each particular surface.

9.2 Recommended paint systems.- The recommended paint systems developed are as follows:

Paint System for Ferrous Surfaces	-	Table II, page 19
Paint System for Zinc Surfaces	-	Table III, page 20
Paint System for Aluminum and Aluminum Alloy Surfaces	-	Table IV, page 21
Paint System for Magnesium Alloy Surfaces	-	Table V, page 22
Paint System for Wood Surfaces	-	Table VI, page 23
Paint System for Miscellaneous Surfaces	-	Table VII, page 24

9.3 How to use the paint systems tables.- This standard can readily be used to extract pertinent data by excerpts of desired sentences and/or paragraphs, or by calling for a paint system in accordance with Tables II to VII inclusive. Select and specify a paint system in accordance with the type of surface which must be painted, the gloss required, application characteristics desired and the exposure/environmental service condition.

9.3.1 Gloss.- The degree to which a painted surface possesses the property of reflecting light in a mirror-like manner (specular reflection). The extent to which this property is developed depends mainly on the composition of the paint, surfaces ranging from dead flat to full gloss being obtainable. The following stages in increasing order of gloss are normally recognized.

Flat (or matt). Practically free from sheen even when viewed from oblique angles. (Usually less than 15 on 85° meter).

Eggshell flat. (Usually from 10 to 15 on 60° meter).

Eggshell gloss. (Usually from 15 to 30 on 60° meter).

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Semigloss. (Usually from 30 to 70 on 60° meter).

Full gloss. Smooth and almost mirror-like surface when viewed from all angles. (Usually above 70 on 60° meter).

60-degree specular gloss, Method 6101, Federal Standard No. 141 (*) is used for the determination of specular gloss of most nonmetallic specimens and for determining when Methods 6103 (85-degree specular gloss, sheen) and 6104 (20-degree specular gloss) are not applicable.

85-degree specular gloss, sheen, Method 6103, Federal Standard No. 141, (*) is used for the determination of specular gloss of nonmetallic specimens having a 60° specular gloss lower than 30 as measured by Method 6101.

20-degree specular gloss, Method 6104, Federal Standard No. 141, (*) is used for measuring the gloss of nonmetallic specimens having a 60° specular gloss higher than 70, as measured by Method 6101.

Illustrations: For high gloss: MIL-E-7729 or TT-E-489

For semigloss finishes: TT-E-529

For lusterless or flat finishes: TT-C-001558 (FAA or TRANS) or TT-E-527

(*) Painted surfaces

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TABLE II

PAINT SYSTEMS FOR FERROUS SURFACES

SYSTEM NUMBER	SURFACE EXPOSURE	SURFACE CLEANING PARAGRAPH	SURFACE PRETREATMENT PARAGRAPH	FIRST COAT	SECOND COAT	FINISH COAT	TOTAL DRY FILM THICKNESS
FS-1	Subject to normal atmospheric exposure	5.2 and 5.3	6.1	TT-P-615 or TT-P-645 or TT-C-001558 (FAA-TRANS)		TT-E-489 TT-C-001558 (FAA-TRANS) TT-E-529 TT-E-527	2.0 mils minimum
FS-2	Subject to normal atmospheric exposure	5.2 and 5.3	6.1	Interior Acrylic Enamel		Interior Acrylic Enamel	1.5 mils minimum
FS-3(1)	Subject to high humidity, condensation or occasional exposure to water	5.2 and 5.3	6.1	TT-P-615 or TT-P-645 or MIL-P-12742, Type I	TT-P-615 or TT-P-645	TT-E-489 or TT-E-529 TT-E-527	3.0 mils minimum
FS-4	Subject to high humidity, condensation or occasional exposure to water	5.2 and 5.3	6.1	Exterior Acrylic Enamel		Exterior Acrylic Enamel	2.0 mils minimum
FS-5(1)	Items subjected to water immersion or similar exposure	5.2 and 5.3	6.1	MIL-P 12742, Type I	MIL-P- 12742, Type I	TT-E-522	3.5 mils minimum
FS-6	Items subjected to water immersion or similar exposure	5.2 and 5.3	6.1	Exterior Acrylic Enamel		Exterior Acrylic Enamel	2.5 mils

(1) The first and second coats shall be built to a minimum dry film thickness of 2 mils.

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TABLE III
PAINT SYSTEMS FOR ZINC SURFACES

SYSTEM NUMBER	SURFACE EXPOSURE	SURFACE CLEANING PARAGRAPH	SURFACE PRETREATMENT PARAGRAPH	FIRST COAT	SECOND COAT	FINISH COAT	TOTAL DRY FILM THICKNESS
ZS-1	Subject to normal atmospheric exposure	5.4	6.1	MIL-P-8585 or MIL-P-12742 or TT-P-641, Types I or II	----	TT-E-489 or MIL-E-7729 TT-E-529 TT-E-527	2.5 mils minimum
ZS-2	Subject to normal atmospheric exposure	5.4	6.1	Interior Acrylic Enamel	----	Interior Acrylic Enamel	1.5 mils minimum
ZS-3 ⁽¹⁾	Subject to high humidity, condensation or occasional exposure to water	5.4	6.1	MIL-P-8585 or MIL-P-12742 or TT-P-641, Types I or II, or MIL-P-12742, Type I	MIL-P-8585 or MIL-P-12742 or TT-P-641, Types I or II	TT-E-489 or MIL-E-7729 TT-E-529 TT-E-527	3.0 mils minimum
ZS-4	Subject to high humidity, condensation or occasional exposure to water	5.4	6.1	Exterior Acrylic Enamel	----	Exterior Acrylic Enamel	2.0 mils minimum
ZS-5 ⁽¹⁾	Items subjected to water immersion or similar exposure	5.4	6.1	MIL-P-12742, Type I TT-P-641, Type III	MIL-P-12742, Type I TT-P-641, Type III	TT-E-522	3.5 mils minimum
ZS-6	Items subjected to water immersion or similar exposure	5.4	6.1	Exterior Acrylic Enamel	----	Exterior Acrylic Enamel	2.5 mils minimum

(1) The first and second coats shall be built to a minimum film thickness of 2 mils.

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TABLE IV
PAINT SYSTEMS FOR ALUMINUM AND ALUMINUM ALLOY SURFACES

SYSTEM NUMBER	SURFACE EXPOSURE	SURFACE CLEANING PARAGRAPH	SURFACE PRETREATMENT PARAGRAPH	FIRST COAT	SECOND COAT	FINISH COAT	TOTAL DRY FILM THICKNESS
AS-1	Subject to normal atmospheric exposure (interior)	5.5	6.1	TT-P-645 TT-C-001558 (FAA-TRANS)		TT-E-489 TT-C-001558 (FAA-TRANS) TT-E-529 TT-E-527	2.5 mils minimum
AS-2	Subject to normal atmospheric exposure (interior)	5.5	6.1	Interior Acrylic Enamel		Interior Acrylic Enamel	1.5 mils minimum
AS-3 (1)	Subject to high humidity, condensation or occasional exposure to water (exterior)	5.5	6.1	TT-P-645 MIL-P-12742, Type I	TT-P-645	TT-E-489	3.0 mils minimum
AS-4	Subject to high humidity, condensation or occasional exposure to water (exterior)	5.5	6.1	Exterior Acrylic Enamel		Exterior Acrylic Enamel	2.0 mils minimum
AS-5 (1)	Items subject to water immersion or similar exposure	5.5	6.1	MIL-P-12742, Type I,	MIL-P-12742, Type I	TT-E-522	3.5 mils minimum
AS-6	Items subject to water immersion or similar exposure	5.5	6.1	Exterior Acrylic Enamel		Exterior Acrylic Enamel	2.5 mils minimum

(1) The first and second coats shall be built to a minimum film thickness of 2.0 mils.

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TABLE V
PAINT SYSTEMS FOR MAGNESIUM ALLOY SURFACES

SYSTEM NUMBER	SURFACE EXPOSURE	SURFACE CLEANING PARAGRAPH	SURFACE PRETREATMENT PARAGRAPH	FIRST COAT	SECOND COAT	FINISH COAT	TOTAL DRY FILM THICKNESS
MS-1	Subject to normal atmospheric exposure (interior)	5.6	6.2	MIL-P-8585 or TT-P-645 or TT-C-001558 (FAA-TRANS)		TT-E-489 or MIL-E-7729 or TT-E-527 or TT-C-001558 (FAA-TRANS)	2.5 mils minimum
MS-2	Subject to normal atmospheric exposure (interior)	5.6	6.2	Interior Acrylic Enamel		Interior Acrylic Enamel	1.5 mils minimum
MS-3 (1)	Subject to high humidity, condensation or occasional exposure to water (exterior)	5.6	6.2	MIL-P-8585 or TT-P-645 or MIL-P-12742, Type I	MIL-P-8585 or 8585 or TT-P-645	TT-E-489 or MIL-E-7729 or TT-E-529 or TT-E-527	3.0 mils minimum
MS-4	Subject to high humidity, condensation or occasional exposure to water (exterior)	5.6	6.2	Exterior Acrylic Enamel		Exterior Acrylic Enamel	2.0 mils minimum
MS-5 (1)	Items subject to water immersion or similar exposure	5.6	6.2	TT-P-641, Type III, or MIL-P-12742, Type I	TT-P-641, Type III, or MIL-P-12742, Type I	TT-E-522	3.5 mils minimum
MS-6	Items subject to water immersion or similar exposure	5.6	6.2	Exterior Acrylic Enamel		Exterior Acrylic Enamel	2.5 mils minimum

(1) The first and second coats shall be built to a minimum film thickness of 2.0 mils.

TABLE IV
PAINT SYSTEMS FOR WOOD SURFACES

SYSTEM NUMBER	SURFACE EXPOSURE	SURFACE CLEANING PARAGRAPH	SURFACE PRETREATMENT PARAGRAPH	FIRST COAT	SECOND COAT	FINISH COAT	TOTAL DRY FILM THICKNESS
WS-1	Subject to normal atmospheric exposure (interior)	5.7.	6.3	TT-P-636 or TT-C-001558 (FAA-TRANS)		TT-E-529 TT-E-489 or TT-C-001558 (FAA-TRANS) or MIL-E-7729 TT-E-527	2.0 mils minimum
WS-2	Subject to high humidity, condensation or occasional exposure to water (exterior)	5.7	6.3	TT-P-636 MIL-P-12742 Type II	TT-P-636	TT-E-489 or MIL-E-7729 TT-E-529	2.5 mils minimum
WS-3 (1)	Items subject to water immersion or similar exposure	5.7	6.3	MIL-P-12742, Type II	MIL-P-12742, Type II	TT-E-522	3.0 mils minimum

(1) The first and second coats shall be built to a minimum film thickness of 2.0 mils.

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TABLE VII
PAINT SYSTEMS FOR MISCELLANEOUS SURFACES

SYSTEM NUMBER	SURFACE	SURFACE CLEANING	SURFACE PRETREATMENT	FIRST COAT	SECOND COAT	FINISH COAT	TOTAL DRY FILM THICKNESS
XS-1	Engines and engine accessories	Manufacturer's standard system	Manufacturer's standard system	Manufacturer's standard system			---
XS-2	Components and parts subject to temperatures of 450°F. or higher	In accordance with applicable paragraph in Chapter 5	----	MIL-P-14105	----	MIL-P-14105	2.5 mils minimum
XS-3	Electrical components	Cleaning, pretreatment and painting in accordance with manufacturer's standard practice					
XS-4	Any surface requiring fire retardant coatings	See appropriate paragraph in Chapter 5	See appropriate paragraph in Chapter 6	MIL-C-46081	----	MIL-C-46081	2.5 mils minimum
XS-5	Corrosion resistant steel surfaces not to be painted	See paragraph 6.5	Paragraph 6.5	----	----	MIL-C-13924, Class 2	To cover

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